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BRYOPHYTES IN A SUB-TROPICAL MANGROVE COMMUNITY

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Summary

A descriptive and quantitative analysis of the bryophyte species in sub-tropical mangroves in southern Queensland, their host/substrata relationship and their occurrence relative to the adjacent non-mangrove environment is presented here. The study is based on 337 collections.

Introduction

Bryophyte ecology has become an important discipline not only to the specialist working within his particular field but also within general ecology. The majority of work has been carried out in temperate or polar regions where a considerable amount of progress has been made, resulting in at least a reasonable understanding of the position of bryophyte life in relation to the overall environment. Unfortunately this cannot be said of the tropics and sub-tropics, particularly as regards marginal or highly specific habitats such as those of the savannah, lowland rainforests or mangroves (Richards 1984).

Geography, climate and physical aspects

The areas studied comprise the tidal or mangrove-supporting sections of the Noosa, Maroochy and Mooloola River systems on the southern Queensland coast between approximately 26°20′S and 26°45′S, 80–120 km north of Brisbane. They contain typical sub-tropical mangrove communities (Lear & Turner 1977) extending up to 20 km inland. Those of the Noosa and Mooloola Rivers are principally composed of a narrow fringing zone and saline marshes, while the Maroochy River, with its richer nutrients and hence substrate, supports a more varied mangrove flora including extensive areas of closed *Bruguiera* forest. Upstream, the landward margin of the mangroves merges with freshwater swamps, rainforest or sugar cane plantations while near the river mouths considerable urban development has taken place in recent years. In spite of this, remarkably little of the original mangrove environment has been disturbed up to the present time. The climate of the region is of the sub-tropical, humid, east-coast type, characterized by hot summers, mild winters and a clearly defined wet-season but with sufficient rainfall in all seasons to allow continuous growth of vegetation (Windolf 1985b).

Collecting and recording

Collecting was carried out along transects aligned at right angles to the species/structural zonation. Sufficient transects were employed so as to include all obvious combinations of zoning in various sections of the three separate river systems. Individual host trees (or sub-strata) were numbered and all species found thereon were recorded using this number. In addition such details as density of the surrounding vegetation, height above high-tide level, proximity to non-mangrove vegetation and pertinant information on micro-habitat were also recorded.

Host trees and sub-strata

Because of the inherent saline influence in the mangrove environment, soil, except in the case of upturned tree bases, is virtually eliminated as a sub-stratum and 99% of specimens were found growing either as epiphytes on living trees or on decaying timber above the highest tide level.

Sub-tropical mangrove environments support far fewer tree species than do those of the true tropics. In the area under consideration six mangrove species have been

recorded compared with the eastern Australian coast at 12°S with 28 species and 30°S with 2 species. In addition several other species occur with varying degrees of frequency, not only in the mangroves, but also in adjacent non-saline environments. Of these only one, *Casuarina glauca*, was found to support epiphytic bryophytes within the mangrove environment proper.

The phorophytes/sub-strata which supported bryophytes and the number of each from which specimens were collected are listed in **Table 1**.

Table 1

1.	**Mangroves**	
	Avicenniaceae	
	Avicennia marina (Forsskal) Vierh. var. *australasica* (Walp.) Mold.	15
	Rhizophoraceae	
	Bruguiera gymnorhiza (L.) Savigny	48
	Rhizophora stylosa Griffith	1
	Euphorbiaceae	
	Excoecaria agallocha L.	36
2.	**Other**	
	Casuarinaceae	
	Casuarina glauca Sieber ex Sprengel	51
	Decaying timber (species not defined)	11
	Soil	4
	Total	166

No bryophytes were found on two mangrove species, *Aegiceras corniculatum* (L.) Blanco and *Ceriops tagal* (Perrottet) C.B. Robinson var. *australis* C. White. In the transitional landward zone there is a rapid changeover between mangrove species and those more commonly associated with the adjoining non-mangrove forest. Specimens were collected only from those areas where mangroves formed the major plant type.

Notes on bryophyte species

Hepaticae

GEOCALYCACEAE

Lophocolea semiteres (Lehm. & Lindenb.) Mitt. Cosmopolitan. Very common locally in a wide variety of habitats. Those occurring on mangrove plants were invariably small and weak and in many cases appeared to be struggling to survive.

FRULLANIACEAE

Frullania ericoides (Nees) Mont. Pan-tropical. Locally common in wet sclerophyll forest, woodland and vine scrub. The specimens observed in the mangrove forest were robust and prolifically fertile.

Frullania ferdinandi-muelleri Steph. Endemic to the central-east Australian coastal region (26°S–30°S). Locally common, usually on the fringes of rainforest or in lush wet sclerophyll forest. This species had a definite preference for *Bruguiera gymnorhiza* and *Casuarina glauca* in closed forest or well shaded sites. Specimens of *F. ferdinandi-muelleri* were generally large, robust and often fertile.

Frullania rostrata (J.D. Hook. & Tayl.) J.D. Hook. & Tayl. East Australian coast, New Zealand and the south-west Pacific region. Locally common in light scrub and woodland. It had very limited occurrence in the mangroves, being confined to stunted *Bruguiera gymnorrhiza* in low open woodland in one particular spot.

Table 2. Bryophyte species/host relationships

	Mangroves				Other			
	Avicennia marina	*Bruguiera gymnorrhiza*	*Rhizophora stylosa*	*Excoecaria agallocha*	*Casuarina glauca*	Decaying timber	Soil	Total specimens
Hepaticae								
Lophocolea semiteres		9			4		1	14
Frullania ericoides		3		15	16	7		41
F. ferdinandi-muelleri		13		2	9			24
F. rostrata		6						6
F. subtropica	12	9		13	15	1		50
Acrolejeunea aulacophora	6	13	1	12	16	3		51
Cheilolejeunea intertexta	1	12	1	16		1		31
Cololejeunea lanciloba		6		18		3		27
Lejeunea cucullata						1		1
L. flava ssp. *orientalis*		4		1	2	1		8
Leptolejeunea maculata	8	12		4	3	1		28
Schiffneriolejeunea tumida var. *haskarliana*		1						1
Metzgeria decepiens		1						1
Total Hepatic specimens	27	89	2	81	65	18	1	283
Total Hepatic species	4	12	2	8	7	8	1	13
Musci								
Fissidens humulis		1			4		3	8
Macromitrium aurescens	3			7	16	5		31
Sematophyllum sp.		1			8	6		15
Total Musci specimens	3	2		7	28	11	3	54
Total Musci species	1	2		1	3	2	1	3
Total specimens	30	91	2	88	93	29	4	337
Total species	5	14	2	9	10	10	2	16

Frullania subtropica Steph. Endemic to the central-east Australian coast (20°S–30°S). Locally common, often in quite dry habitats. This species preferred open sites in the mangroves and often covered large areas of the trunks of *Casuarina glauca* and the near horizontal limbs of *Avicennia marina*. The plants were robust and often fertile. In terms of volume, *F. subtropica* is probably the dominant bryophyte in the mangroves.

LEJEUNEACEAE

Acrolejeunea aulacophora (Mont.) Steph. Widespread throughout the Pacific and Indian Ocean regions. Very common locally in a wide variety of habitats and it was well diversified throughout most parts of the mangrove environment.

Cheilolejeunea intertexta (Lindenb.) Steph. Pan-tropical and sub-tropical. Uncommon in the surrounding areas. Had a distinct preference for *Excoecaria agallocha* and *Bruguiera gymnorrhiza*, particularly in stunted mangrove scrub.

Cololejeunea lanciloba Steph. Tropical south-west Pacific, south-east Asian regions and Japan. Relatively common in nearby rainforest and scrub. This species was generally well developed, prolifically fertile and obviously relishes this particular habitat. *Excoecaria agallocha* in dense closed forest was the preferred host/habitat.

Lejeunea cucullata (Reinw., Blume & Nees) Nees. Widespread in tropical areas of the Indo-Pacific region. As only a single specimen was collected, it suggests that the mangroves are not a preferred habitat, but the species is also rare in the surrounding vegetation.

Lejeunea flava (Sw.) Nees subsp. *orientalis* Schust. Widespread, the species being cosmopolitan. Extremely common locally in rainforest, wet sclerophyll forest and damp woodland. In the mangroves it was confined to the lush closed forest and the plants collected were not particularly well developed.

Leptolejeunea maculata (Mitt.) Schiffn. Widespread in tropical regions. The species is reasonably common locally and the specimens from the mangroves were robust and well established in a variety of micro-habitats.

Schiffneriolejeunea tumida (Nees) Grad. var. *haskarliana* (Gott.) Grad. & Terken. South-west Pacific and south-east Asian regions. Uncommon locally and as only a single specimen was collected from the mangroves, it indicates its rarity in that habitat as well.

METZGERIACEAE

Metzgeria decipiens (Massal.) Schiffn. & Gott. Australia, New Zealand and the Pacific region. Locally common, but mostly in upland rainforest and wet sclerophyll forest. The single specimen found in the mangroves was small and poorly developed.

Musci

FISSIDENTACEAE

Fissidens humilis Dix. & Watts. Eastern Australia and New Zealand. Reasonably common locally on damp banks and tree bases, particularly *Melaleuca quinquinervia* in freshwater swamps. In the mangroves it favoured relatively open positions with broken sunlight, only a few centimetres above the high tide level, occurring on bark and on soil retained between the roots of upturned trees.

ORTHOTRICHACEAE

Macromitrium aurescens Hampe. Endemic to north-east Australia. Local distribution is unknown apart from the mangroves but it is probably not common. Its preferred habitat in the mangroves was on *Excoecaria agallocha* in open woodland and in open forest on *Casuarina glauca*, often in very exposed situations above the main canopy. This tallies with Vitt and Ramsay's (1985) comment that this species of *Macromitrium* appears to be somewhat xerophytic having an affinity with rough barked host species.

SEMATOPHYLLACEAE

Sematophyllum sp. *Sematophyllum* is a widespread, very complex genus usually associated with damp habitats although some species are found in seasonally drier areas. The genus is very common in surrounding districts where a number of species occur. Specimens have not yet been identified to species level.

Conclusions

Analysis of the data revealed some significant ecological peculiarities as regards the bryophyte flora on the mangroves of this area. These can be summarised as follows:

A. Hepatics outnumbered the Musci both in terms of species (Hepatics 84%, Musci 16%) and individual plants.

B. Hepatic specimens were dominated by the genera *Frullania* (43%), *Acrolejeunea* (18%), *Cheilolejeunea* (11%), *Leptolejeunea* (10%) and *Cololejeunea* (10%), others being of only spasmodic occurrence. *Macromitrium* (57%) and *Sematophyllum* (28%) account for the majority of mosses.

C. Virtually all specimens were epiphytic (99%) because of the peculiar nature of the mangrove environment.

D. Species prevalence varied somewhat from that of adjacent non-mangrove environments.

E. Some marked bryophyte/phorophyte relationships existed.

Although the area studied is essentially sub-tropical in form, it exhibits many positive similarities to those observed by Thaitong in the tropical mangrove forests of Thailand (Thaitong 1984). This is particularly so with regard to Hepatic genera. Of the 12 recorded by Thaitong and the 9 described here, 7 are common to both areas. Whether or not these factors are constant in mangrove environments will only be revealed by comparing detailed studies carried out in different areas.

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